Active Project (2016 - 2018)

Generic FMS Platform for Evaluation of Autonomous Trajectory-Based Operation Concepts, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

The objective of the Phase II work is to develop a generic, advanced Flight Management System (FMS) for the evaluation of autonomous 4D-trajectory based operations (4DTBO) concepts. The work will address the following limitations of most commercially available FMS: they have limited advanced features; are specific to a single aircraft type; and cannot be readily modified by researchers. The proposed research will identify and extend advanced FMS features for the simulation evaluation of 4DTBO concepts in different phases of flight, based on the feasibility demonstration during Phase I work. Some of proposed feature include (i) advanced 4D guidance modes such as Required Time of Arrival (RTA), 4DFMS, and Interval Management (IM), (ii) high-fidelity wind modeling and wind update capability for improved predictability, (iii) trajectory negotiation, (iv) optimal 4D trajectory planning. Phase II work will develop a generic FMS interface to NASA's Multi-Aircraft Control System (MACS) to enable the evaluation of FMS modules from multiple vendors in 4DTBO simulations. The proposed FMS platform and the generic FMS interface will allow the users to deploy a wide array of autonomy enabling FMS features through a Graphical User Interface. All the algorithms and software developed under this research will be delivered to NASA at the end of the project.

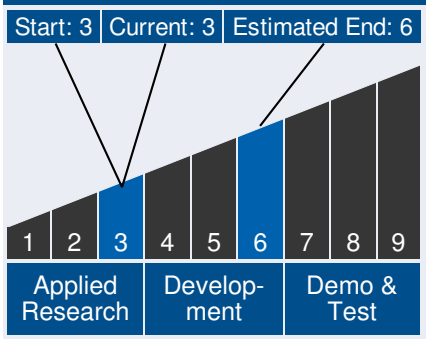
ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The FMS platform developed under the proposed research is an enabling technology for autonomicity (or self-management) - based architectures for the entirety, or parts, of the NextGen airspace operations. It will augment the capabilities of NASA MACS ATM simulation environment to allow the evaluation of 4DTBO concepts by enabling new features such as RTA, and ADS-C. Generic MACS-FMS interface developed under the Phase II

Table of Contents

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

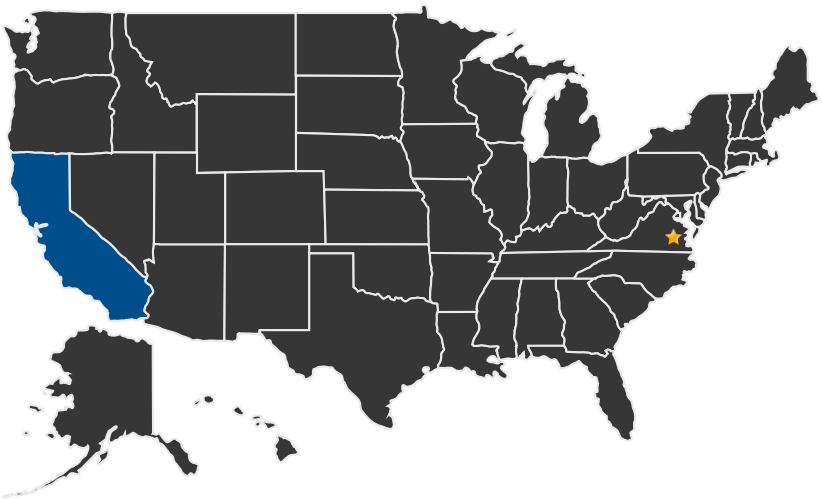
Continued on following page.

work can be used to evaluate next-generation FMS products from multiple vendors in human-in-the-loop simulations.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The FMS platform developed under the proposed research will be of interest to NASA, FAA, and other ATM research organizations. It is expected that some of the next-generation FMS features developed under the Phase II research may also be of interest to commercial FMS manufacturers. The technologies will also be useful to the Unmanned Aerial System community for investigating the interactions of autonomous UAS with other highly automated aircraft operating in the National Airspace System. 4DTBO technologies developed under the proposed work has applications in other high-density transportation problems such as highway, railway and maritime traffic management.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Management Team *(cont.)*

Principal Investigator:
- P. K. Menon

Technology Areas

Primary Technology Area:
Modeling, Simulation, Information Technology and Processing (TA 11)
- Simulation (TA 11.3)
  - Simulation-Based Systems Engineering (TA 11.3.3)

Other Organizations Performing Work:

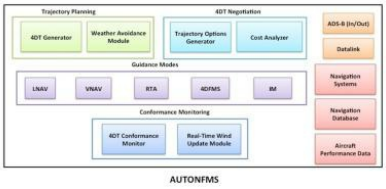
- Optimal Synthesis, Inc. (Los Altos, CA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23417)

IMAGE GALLERY



Generic FMS Platform for Evaluation of Autonomous Trajectory-Based Operation Concepts, Phase II

DETAILS FOR TECHNOLOGY 1

Technology Title

Generic FMS Platform for Evaluation of Autonomous Trajectory-Based Operation Concepts, Phase II

Potential Applications

The FMS platform developed under the proposed research is an enabling technology for autonomicity (or self-management) - based architectures for the entirety, or parts, of the NextGen airspace operations. It will augment the capabilities of NASA MACS ATM simulation environment to allow the evaluation of 4DTBO concepts by enabling new features such as RTA, and ADS-C. Generic MACS-FMS interface developed under the Phase II work can be used to evaluate next-generation FMS products from multiple vendors in human-in-the-loop simulations.